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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,136	11/25/2003	Ikunao Isomura	245733US2SRD	4417
22850 7590 10/03/2007 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER LIEW, ALEX KOK SOON	
			ART UNIT 2624	PAPER NUMBER
			NOTIFICATION DATE 10/03/2007	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/720,136	Applicant(s) ISOMURA,	
	Examiner Alex Liew	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8-11 and 16-22 is/are rejected.
- 7) ☒ Claim(s) 5-7 and 12-15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

The amendment filed on August 2, 2007 is entered and made of record.

Response to Applicant's Arguments

1. On page 3, the applicant stated:

Specht detects misalignment between two dies by comparing a first stream of data having signal values representing the image content of each pixel thereof with a second stream of data having signal values representing the intended image content of the first stream of data. Fig. 1 of Specht shows two optical system and comparison means.

The misalignment measurement of Specht is another function perform by Specht.

Specht discloses first imaging optics which forms first optical image of a pattern formed on an inspection target plate on the basis of design pattern data, shown in figure 1, element 18, and a second imaging optic which forms first optical image of a pattern formed on an inspection target plate on the basis of design pattern data, shown in figure 1, element 20. The detected patterns from the first and second imaging optics then forms an image of pixels, discussed on column 5 lines 16 to 21.

2. On page 4, the applicant stated:

Thus, Specht does not disclose or suggest "a repeated pattern area detector" recited in Claim 1, and is therefore clearly deficient.

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Specht teaches a 'repeated pattern detector' device; Specht teaches comparing patterns, patterns that are identical to each other; for example performing die-to-die comparison on an area of pattern in the wafer image on two separate dies, reads on 'repeated pattern detector' because the imaging systems are looking for same repeated patterns. If the dies are not the same then there is a potential defect in one or both of the dies, but if both die patterns are the same then it is concluded that there is no defects in both of the examined die images.

3. On page 5, the applicant stated:

However, it is respectfully submitted that Tsai merely includes the isolated teaching of adjusting magnification by using a zoom lens. There is no motivation in the cited references to combine this teaching of Tsai with that of Specht that simply compares two equivalent dies, or that of Jun that detects failures by scanning one detector.

The examiner agrees with the applicant. However, a new search shows that Alumot (US pat no 5,699,447) discloses a two-phase inspection process of wafers (see figure 1, elements 7 and 11). In the first phase, the complete surface of the wafer is inspected at a lower spatial resolution, so information is outputted indicating suspected locations on the wafer having high probability of a defect (see column 5, lines 24 to 27 and lines 37 to 39), which reads on limitations 'second imaging optics which forms second optical image of the pattern, the second imaging optics serving to scan an entire region of the pattern on the inspection target plate with an optical magnification lower than that of the

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first imaging optics' and 'a low-resolution image data generator which generates second detected pattern data corresponding to the entire region of the pattern on the inspection target plate using a second optical image'. In the second phase, only the suspected locations stored in the storage device are examined with a higher spatial resolution (see column 5, lines 27 to 31).

The examiner will make a new ground of rejection relying on Specht (US pat no 4,805,123) and Alumot (US pat no 5,699,447).

DETAILED ACTION

Claim Objections

Claims 5 – 7 and 12 – 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regards to claim 5, the examiner cannot find any applicable prior art and / or suggestions disclosing the repeated pattern area detector detects whether candidates for the plurality of repeated pattern areas exist in the second detected pattern data, measures area sizes of the candidates with a first optical magnification lower than an optical magnification of the first imaging optics *if the candidates exist, re-acquires* image data of the pattern with a second optical magnification higher than the first optical magnification within the detected area sizes, judges a coincidence degree of the

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candidates on the basis of the re-acquire image data, and registers the candidates, when judged to coincide, as the plurality of repeated pattern areas in combination with all the limitations of claim 1.

With regards to claim 12, see the rationale for claim 5.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 19 is rejected under 35 U.S.C. 102(b) as being anticipated by Specht (US pat no 4,805,123).

With regards to claim 19, A pattern inspection apparatus which perform die-to-die inspection of comparing detected pattern data of one area with detected pattern data of another area among a plurality of repeated pattern areas (see figure 1, elements 18, 20 and 44, shows a die to die inspection system), and die-to-database inspection of comparing the detected pattern data with reference pattern data obtained from design pattern data (see column 7, lines 22 to 25), comprising:

imaging optics which form an optical image of a pattern formed on an inspection target plate on the basis of the design pattern data (see figure 1, elements 18 and 20);

a detected pattern data generator which detects the optical image and generates the detected pattern data (see column 5 lines 16 to 21, the input data from the wafer gets converted into image pixel data);

a repeated pattern area detector which analyzes layout information of the design pattern data and detects the plurality of repeated pattern areas (comparing patterns, patterns that are identical to each other; for example performing die-to-die comparison on an area of pattern in the wafer image on two separate dies, reads on 'repeated pattern detector' because the imaging systems are looking for same repeated patterns; if the dies are not the same then there is a potential defect in one or both of the dies, but if both die patterns are the same then it is concluded that there is no defects in both of the examined die images); and

a comparator which sequentially compares a plurality of detected pattern areas on the second detected pattern data corresponding to the plurality of repeated pattern areas detected by the repeated pattern area detector in accordance with die-to-die comparison (see figure 1, elements 38 and 44 and discussion for previous limitation).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 – 4, 8 – 11 and 16 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Specht (US pat no 4,805,123) in view of Alumot (US pat no 5,699,447).

With regards to claim 1, Specht discloses a pattern inspection apparatus, which performs die-to-die inspection of comparing detected pattern data of one area with detected pattern data of another area among a plurality of repeated pattern areas (see fig 1 – 10), comprising

first imaging optics which forms first optical image of a pattern formed on an inspection target plate on the basis of design pattern data (see figure 1, element 18);

a detected pattern data generator which detects the first optical image and generates first detected pattern data (see column 5 lines 16 to 21, the input data from the wafer gets converted into image pixel data);

second imaging optics which forms second optical image of a pattern formed on an inspection target plate on the basis of design pattern data (see figure 1, element 20);

a detected pattern data generator which detects the second optical image and generates second detected pattern data (again see column 5, lines 16 to 21);

a repeated pattern area detector which detects the plurality of repeated pattern areas from the second detected pattern data (comparing patterns, patterns that are identical to each other; for example performing die-to-die comparison on an area of pattern in the wafer image on two separate dies, reads on 'repeated pattern detector'

because the imaging systems are looking for same repeated patterns; if the dies are not the same then there is a potential defect in one or both of the dies, but if both die patterns are the same then it is concluded that there is no defects in both of the examined die images); and

a comparator which sequentially compares the first and second input data of the repeated pattern areas to perform die-to-die comparison (see figure 10, the input data from the left and right die are compared with each other and defects are detected using image difference).

Specht does not using the second imaging means to capture the image of the entire wafer and detects repeating patterns from the image obtained from the second imaging means. Alumot discloses a complete surface of the wafer is inspected at a lower spatial resolution, so information is outputted indicating suspected locations on the wafer having high probability of a defect (see column 5, lines 24 to 27 and lines 37 to 39), which reads on limitations 'second imaging optics which forms second optical image of the pattern, the second imaging optics serving to scan an entire region of the pattern on the inspection target plate with an optical magnification lower than that of the first imaging optics' and 'a low-resolution image data generator which generates second detected pattern data corresponding to the entire region of the pattern on the inspection target plate using a second optical image.' One skilled in the art would include imaging entire pattern region means and detect repeated pattern means because those repeated patterns are most likely ones that have defects in them and detecting the repeated patterns will locate the defect in the wafer and improve inspection process.

With regards to claim 2, Specht discloses an apparatus according to claim 1, wherein the repeated pattern area detector detects the plurality of repeated pattern areas by pattern matching on the basis of a similarity on a pattern layout of the second detected pattern data (see fig 10 – the left image is matched with the right image to find defects).

With regards to claim 3, Specht discloses an apparatus according to claim 2, wherein the similarity in the pattern includes a pitch and size of the plurality of repeated pattern areas (see fig 10 – the pitch of the left and right images is 4 pixels and the size of the left and right images are 2 X 2).

With regards to claim 4, Specht discloses an apparatus according to claim 1, wherein the repeated pattern area detector further performs detection of the plurality of repeated pattern areas on the basis of the design pattern data (see figure 10 – the design of those left and right images are to have a dark pixels in the upper left corner of the image window).

With regards to claim 8, an extension to the rejection of claim 1, Alumot discloses those repeated patterns having square shapes (see figure 9, the vertical length of each die is longer than the horizontal length). Whether detecting square, rectangular or any other generic shapes, it is just a matter of design as to how the dies are manufactured and does not change the image processing steps of the system. One skill in the art would

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include a rectangular shape die because it can be easily manufacture, which takes less time to send to the market.

With regards to claim 9, an extension to the rejection of claim 8, the size of the die does not change the image processing steps needed to inspect the dies, and semiconductor electronic of various sizes are well known (MPEP 2144.03). One skill in the art would choose a size of 1 mm square or less because to manufacture more chips with lesser which improve productivity and profit gain.

With regards to claims 10 and 11, see the rationale and rejection for claim 1.

With regards to claim 16, see the rationale and rejection for claim 8.

With regards to claim 17, see the rationale and rejection for claim 9.

With regards to claim 18, see the rationale and rejection for claim 10.

With regards to claim 22, see the rationale and rejection for claim 1.

3. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Specht (US pat no 4,805,123) in view of official notice (MPEP 2144.03).

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With regards to claim 20, an extension to the discussions in the rejection for claim 19, whether detecting square, rectangular or any other generic shapes, it is just a matter of design as to how the dies are manufactured and does not change the image processing steps of the system. One skill in the art would include a rectangular shape die because it can be easily manufacture, which takes less time to send to the market.

With regards to claim 21, an extension to the rejection of claim 20, the size of the die does not change the image processing steps needed to inspect the dies, and semiconductor electronic of various sizes are well known (MPEP.2144.03). One skill in the art would choose a size of 1 mm square or less because to manufacture more chips with lesser which improve productivity and profit gain.

Conclusion

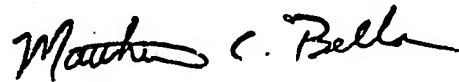
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alex Liew whose telephone number is (571)272-8623. The examiner can normally be reached on 9:30AM - 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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